CLAIMS

What is claimed is:

1. A flooded heat exchanger comprising:

a vessel body having a process portion and a heating fluid portion isolated from the process portion, the vessel body being configured to facilitate heat transfer between the process portion and the heating fluid portion;

a heating fluid inlet configured to direct heating fluid to the heating fluid portion of the vessel body;

a heating fluid outlet configured to remove heating fluid from the heating fluid portion of the vessel body;

a process liquid inlet configured to direct process liquid to the process portion of the vessel body;

a control valve configured to control an amount of process liquid entering the process portion of the vessel body;

a process gas inlet configured to direct process gas to the process portion of the vessel body, the process gas inlet being located below a desired process liquid level in the process portion of the vessel body such that process gas entering the process portion of the vessel body bubbles through at least some of the process liquid;

a process vapor outlet configured to remove process vapor from the process portion of the vessel body, the process vapor outlet being located above the desired process liquid level; and

a level control device fluidly coupled to the process portion of the vessel body, a first portion of the level control device communicating with an upper location on the vessel body above the desired process liquid level and a second portion of the level control device communicating with a lower location on the vessel body below the desired process liquid level, the level control device operating the control valve to maintain an actual process liquid level at least close to the desired process liquid level.

2. The flooded heat exchanger of claim 1 wherein the process gas inlet has a length extending at least partially through the process portion of the vessel body, and wherein the process gas inlet comprises a plurality of openings spaced apart from each other to disperse the process gas escaping therefrom along the length.

3. The flooded heat exchanger of claim 1 wherein the process gas inlet has a length extending at least partially through the process portion of the vessel body, and wherein the process gas inlet comprises a plurality of pores spaced apart from each other to create small bubbles of process gas and to disperse the bubbles of process gas along the length.

4. The flooded heat exchanger of claim 1, further comprising a plurality of dividers positioned above the process gas inlet, the dividers configured to disperse the process gas throughout the process portion of the heat exchanger.

5. The flooded heat exchanger of claim 1 wherein the process gas inlet has a length extending at least partially through the process portion of the vessel body, and wherein the process gas inlet comprises a plurality of openings spaced apart from each other to disperse the process gas escaping therefrom along the length, and further comprising a plurality of dividers positioned above the process gas inlet, the dividers configured to disperse the process gas throughout a width of the process portion of the heat exchanger.

6. The flooded heat exchanger of claim 1 wherein the process liquid inlet comprises a trap configured to prevent the process gas from traveling through the process liquid inlet.

7. The flooded heat exchanger of claim 1 wherein the level control device operates the control valve to maintain the actual process liquid level at a constant level.

8. A system for facilitating the calculation of a steam-carbon ratio in a steam reformer, comprising:

a flooded heat exchanger configured to provide steam to the reformer, the flooded heat exchanger having a heat exchanger body with a process portion and a heating fluid portion isolated from the process portion, the heat exchanger body being configured to facilitate heat transfer between the process portion and the heating fluid portion;

a heating fluid inlet configured to direct heating fluid to the heating fluid portion of the heat exchanger body;

a heating fluid outlet configured to remove heating fluid from the heating fluid portion of the heat exchanger body;

a process liquid inlet configured to direct water to the process portion of the heat exchanger body;

a control valve configured to control an amount of water entering the process portion of the heat exchanger body;

a water meter configured to calculate the amount of water entering the process portion of the heat exchanger body;

a process vapor outlet configured to remove steam from the process portion of the heat exchanger body, the process vapor outlet being located above a water level in the process portion of the heat exchanger body; and

a level control device coupled to the process portion of the heat exchanger body, the level control device being operable with the control valve to maintain the water level in the process portion of the heat exchanger body at a constant level such that a reading on the water meter provides the amount of steam generated by the heat exchanger to facilitate calculation of the steam-carbon ratio.

9. The system of claim 8 wherein a first portion of the level control device communicates with an upper location on the heat exchanger body above the water level and a second portion of the level control device communicates with a lower location on the heat exchanger body below the water level.

10. The system of claim 8, further comprising a process gas inlet configured to direct a fuel gas to the process portion of the heat exchanger body, the process gas inlet being located below the water level in the process portion of the heat exchanger body such that the fuel gas entering the process portion of the heat exchanger body bubbles through at least some of the water.

11. The system of claim 8, further comprising a heat exchanger bypass line configured to route water to the reformer without the water passing through the heat exchanger.

12. A method for determining the amount of steam entering a steam reformer to facilitate calculation of a steam-carbon ratio in the reformer, the method comprising:

providing a heat exchanger configured to provide steam to the reformer;

providing a water meter configured to register an amount of water entering the heat exchanger;

maintaining a water level in the heat exchanger constant during a period of operation;

reading a register on the water meter to determine the amount of water entering the heat exchanger during the period of operation; and

calculating the steam-carbon ratio in the reformer based on the reading from the water meter, knowing that an amount of steam generated by the heat exchanger during the period of operation is equal to the amount of water provided to the heat exchanger during the same period.

13. The method of claim 12, further comprising an external level indicator coupled to the heat exchanger, and wherein maintaining the water level in the heat exchanger comprises measuring a liquid level in the external level indicator and adjusting a flow of water to the heat exchanger.

14. The method of claim 12, further comprising introducing fuel gas into the heat exchanger, and bubbling the fuel gas through the water to absorb water vapor from the water and carry the water vapor to the reformer.